AGRICULTURAL NEWS LETTER

VOL. 5 - NO. 1 JANUARY, 1937

This publication gives information on new developments of interest to agriculture on laboratory and field investigations of the du Pont Company and its subsidiary companies.

In addition to reporting results of the investigations of the Company and its subsidiaries, published reports and direct contributions of investigators of agricultural experiment stations and other institutions are given dealing with the Company's products and other subjects of agricultural interest.

DU PONT
REG. U. S. PAT. OFF.

ISSUED BY PUBLICITY DEPARTMENT, E. I. DU PONT DE NEMOURS & CO., INC., WILMINGTON, DEL.

General

AGRICULTURAL NEWS LETTER

Vol. 5 - No. 1 January 1937.

This issue contains:

THE PHARMACOLOGICAL ACTION AND PATHOLOGIC EFFECTS OF ALKYL RHODANATES IN RELATION TO THEIR CHEMICAL CONSTITUTION AND PHYSICAL-CHEMICAL PROPERTIES

EDITOR'S NOTE:- This abstract supplies data not previously available on important phases of the problem of the toxicity of higher alkyl rhodanates. Investigational work of this character is among the activities of the Haskell Laboratory of Industrial Toxicology, Wilmington, Delaware, which was established by the du Pont Company in 1935. Dr. W. F. von Oettingen is the director.

By E. W. Bousquet, Research Chemist,
Experimental Station,
E. I. du Pont de Nemours & Company.

The growing public consciousness to the contamination of commodities and particularly foodstuffs which agriculture, through the use of the available poisonous insecticides, is attempting to protect from destruction by the pests which infest and exact enormous losses from our economic crops has led to an increasing demand for efficient and readily available insecticides which will not endanger human health.

In view of this increasing importance of insect poisons which are relatively non-toxic to man, the pharmacological studies of von Oettingen, Hueper, and Deichmann-Guebler on the long chain aliphatic rhodanates published in the May, 1936 (page 310), issue of the Journal of Industrial Hygiene and Toxicology should be of particular interest to those searching for new contact insecticides. This paper presents a comprehensive pathologic picture of the effect of alkyl rhodanates on warm blooded animals with regard to their toxicity in oral, cutaneous, and subcutaneous administration, as well as the effect of inhalation of the sprayed mists of these products. Up to the publication of this detailed investigation, the scant knowledge of the alkyl rhodanates was confined only to the lower members of the series with no information on the toxicological properties of the higher, less volatile rhodanates containing 8 to 14 carbon atoms. The present study has included seven homologous alkyl rhodanates containing only carbon to carbon linkages and also an ether type of rhodanate, butyl Carbitol rhodanate, whose carbon linkages are interrupted by oxygen.

Toxicity to Warm Blooded Animals

In the straight alkyl series it is indeed surprising to discover that the toxicity of the alkyl rhodanates to warm blooded animals decreases in ascending to the higher homologues in contradistinction to the increasing insecticidal efficiency. It has previously been shown (J. Ind. Eng. Chem., 27 1542 (1935)) that the lower alkyl rhodanates such as the methyl, ethyl and butyl are

Continued on next page

practically devoid of aphicidal activity, whereas the higher members such as octyl, decyl, lauryl, and myristyl possess marked aphicidal effect which reaches a peak at the 12 carbon lauryl derivative. Examination of the physiological data in the present study on higher animals shows that butyl rhodanate is approximately 150 times as toxic as the higher lauryl derivative as judged from the minimum fatal dose with subcutaneous injection on mice. Whereas the time until death for a minimum fatal dose by subcutaneous injection with the methyl rhodanate required only 20 to 46 minutes, 110 minutes to 8 days elapsed before death with the decyl derivative. Such large quantities for injection were required with the lauryl and myristyl rhodanates that the minimum fatal dose could not be definitely established. When administered orally to rats, the minimum fatal dose of lauryl rhodanate was about one hundred times that of methyl rhodanate. Furthermore, when administered at their respective minimum lethal dosages, the methyl rhodanate killed in 5-28 minutes as compared with 2-5 days for the lauryl homologue. Tables showing these relative toxicities to rats and mice are herewith reproduced giving the minimum fatal dose when administered orally or through subcutaneous injection.

Minimal Fatal Dose of Alkyl Rhodanates for Mice and Rats with Subcutaneous Injections

Compound	Mice			Rats		
	Minimal Fatal Dose	Fatalities	Time until Death	Minimal Fatal Dose	Fatalities	Time until Death
	cc./gm. body wt.	%		cc./gm. body wt.	%	
Methyl rhodanate	0.00006	80	20-46 min.	0.000028	70	30-35 min.
Ethyl rhodanate	0.00005	73	40-110 min.	0.00004	70	70 min.-3hrs.
n-Butyl rhodanate	0.00013	70	56-240 min.	0.00007	70	2.5-7 hrs.
Octyl rhodanate	0.0008	80	80 min.-16 hrs.	0.0055	77	4-72 hrs.
Decyl rhodanate	0.02	80	110 min.-8 da.	0.023	80	4.5-72 hrs.
Lauryl rhodanate*	0.02		Delayed			
Myristyl rhodanate*						
n-Butyl-carbitol-rhodanate	0.0002	80	2-4 hrs.	0.0005	70	1.75-11.5 hrs.

*With these compounds the minimal fatal dose could not be determined either in mice or rats on account of the large volumes which would have been required to kill the animals.

Continued on next page

Minimal Fatal Dose of Alkyl Rhodanates
for Rats with Oral Administration

Compound	Minimal Fatal Dose	Fatalities	Time until Death
	cc./rat	%	
Methyl rhodanate	0.02	70	5 min. - 28 min.
Ethyl rhodanate	0.04	82	10 min. - 5.5 hrs.
n-Butyl rhodanate	0.05	80	10 min. - 36 hrs.
Octyl rhodanate	0.30	80	3 hrs. - 8 hrs.
Decyl rhodanate	0.30	80	3 hrs. - 10 hrs.
Lauryl rhodanate	2-3	85	2 days - 5 days
Myristyl rhodanate	3-4	80	4 days - 7 days
n-Butyl-carbitol-rhodanate	0.15	80	35 min. - 3.5 hrs.

Quoting from Dr. von Oettingen's paper, "It was found that even small equimolecular doses of the lower homologues, methyl-, ethyl-, rhodanates and normal butyl Carbitor rhodanate cause a primary stimulation and subsequent paralysis of the medullary centers, whereas n-butyl rhodanate causes only a delayed and moderate stimulation of the respiration, presumably due to local irritation; octyl and decyl rhodanate are only effective in very large doses. Lauryl and myristyl rhodanate are practically ineffective in this respect."

Some interesting speculations on the mechanism of the toxic action of the alkyl rhodanates are proposed in the last section of this physiological study. One of the most interesting observations of these investigators was the liberation of hydrocyanic acid from the alkyl rhodanates by liver pulp, showing that the lower homologues, particularly the methyl and ethyl derivatives, are considerably affected by liver tissue which is able to liberate hydrocyanic acid in appreciable quantities. In this respect the higher homologues, octyl, decyl and myristyl rhodanate, are evidently quite stable. These findings which parallel the toxic effects of these compounds in general and especially their effect on blood pressure and respiration as observed in rabbits, have led the authors to conclude that the action of the lower homologues is largely due to a cyanide effect.

Liberation of Hydrocyanic Acid from
Alkyl Rhodanates by Liver Pulp

Compound	Amount of HCN Formed	Amount of HCN Formed in Control	Amount of HCN Liberated by Liver Action	Amount of HCN Liberated
	gm.	gm.	gm.	%
Methyl rhodanate	0.084	0.026	0.058	36.74
Ethyl rhodanate	0.051	0.015	0.036	22.02
n-Butyl rhodanate	0.015	0.013	0.002	1.26
Octyl rhodanate	0			
Decyl rhodanate	0			
Lauryl rhodanate	0			
Myristyl rhodanate	0			
n-Butyl-carbitol rhodanate	0.023	0.017	0.006	3.14

Continued on next page

For detailed information on the pathological effects the reader is referred to the original article.

One must conclude after reviewing this pharmacological study that the higher alkyl rhodanates, and particularly the lauryl derivative, possess a particularly favorable balance with respect to high insecticidal action and relatively low toxicity to higher animals.

THE HASKELL LABORATORY OF INDUSTRIAL TOXICOLOGY INCREASES ITS STAFF AND EXPANDS ITS FACILITIES

EDITOR'S NOTE:- While there is in Germany a laboratory which conducts research in industrial toxicology along limited lines and with a small staff, the Haskell Laboratory of Industrial Toxicology, established at Wilmington, Delaware, by E. I. du Pont de Nemours & Company, is the only institution of its kind in the United States or elsewhere in the world devoted exclusively to studies of problems growing out of chemical manufacturing processes and the uses of chemical products in industry and agriculture.

Two years ago -- January 22, 1935 -- the Haskell Laboratory of Industrial Toxicology was formally opened and dedicated in the presence of a distinguished group of medical authorities, executives of the du Pont Company and others.

This laboratory was planned to meet a vital need that had developed because of the great growth of the chemical industry in this country as represented by the du Pont organization. Its purpose is to test thoroughly from a health standpoint all products produced by the company before they are placed on the market. An essential part of the work is the testing of insecticides, fungicides and other company manufactures for use in the agricultural field.

A Research Program with Definite Objectives

*The facilities of the laboratory are not employed in the development of compounds useful in therapeutics but emphasis is placed on:

(1)-Determination of the effects which any finished product of the company may have upon the health of the ultimate consumer. This is a public health measure which will enable the company to place its products in the hands of the consumer with definite instructions as to how they shall be handled in order fully to safeguard health.

(2)-Determination of the toxicity, both acute and chronic, of any new compounds which it is proposed to manufacture. This will enable the engineering department to construct new buildings with the exact knowledge necessary to establish the requirements for both building and equipment from the point of view of safeguarding the health of those who work therein. Further, this will place in the hands of the du Pont Medical Division knowledge of the clinical picture to be expected in event of any absorption.

Continued on next page

(3)-Determination of the acute and chronic toxicity of compounds which are now being manufactured by the company, dealing particularly with compounds for which it has already been determined that they have some effects on health.

The laboratory adds to established facilities of clinical medicine already possessed by the du Pont Company and makes for a completely organized industrial medical department in which it will be possible to correlate physical signs, symptoms, and clinical laboratory findings with the research laboratory data. By this combination it will be possible to learn what symptoms indicate the absorption of certain materials, where they are likely to make their attack, and what changes may occur in the organs affected. With this knowledge a protective health regime can be set up in all the plants, which will be a great advance in the improvement of public health, not to mention the service to be rendered to the public at large.

* Industrial and Engineering Chemistry, News Edition, Vol. 13, No. 3.

Personnel Increased and Building Enlarged

The growth of the work of the laboratory has made necessary the increasing of the staff of scientists and technicians from eight to sixteen. In order to provide more space for the workers and to house new scientific equipment, the size of the original large building has been doubled by the addition of two wings. The director of the Haskell Laboratory of Industrial Toxicology is W. F. von Oettingen, who received his chemical training at the Universities of Jena and Gottingen, receiving his Ph.D. at the latter school. He then studied medicine and entered the University of Heidelberg, where he specialized in internal medicine and pharmacology. He came to the United States in 1924, joined the staff of the Medical School of Western Reserve University, Cleveland, Ohio, in 1925, where he taught pharmacology and did research, especially on the relation between chemical constitution and pharmacological action.

The work of the laboratory comes under the Medical Division of the du Pont Service Department. G. H. Gehrmann, M. D., is the director of this division.

ASSOCIATION OF SOUTHERN AGRICULTURAL WORKERS TO MEET IN FEBRUARY.--
The Association of Southern Agricultural Workers will hold its annual meeting in Nashville, Tenn., February 3, 4, and 5, 1937. Programs and hotel information may be secured through Secretary E. S. Center, P. O. Box 4154, Atlanta, Ga.

Speakers on the two general morning programs are Mrs. Edwin Bevens, chairman, Committee on Urban-Rural Cooperation, General Federation of Women's Clubs, Helena, Ark.; J. J. Pelley, president, Association of American Railways; Edw. A. O'Neal, president, American Farm Bureau Federation; Governor William I. Myers, Farm Credit Administration; H. E. Babcock, manager, Grange-League-Federation, New York, N. Y.; and F. A. Silcox, head of U. S. Forest Service. One morning and three afternoons will be devoted to strong programs in the 12 separate sections of the Association.

CEREAL SEED TREATING CAMPAIGN IN MINNESOTA SET A NOTABLE EXAMPLE FOR ORGANIZED EFFORT

EDITOR'S NOTE:- The efficient and aggressive manner in which the United States Department of Agriculture operates to aid farmers in an emergency is well illustrated by what was done to assist Minnesota grain growers in 1935. This work is discussed in the annual report of Mr. R. C. Rose, Extension Plant Pathologist, St. Paul, Minnesota, from which the following is reprinted.

From the standpoint of possible cereal disease hazards, farmers in central and western Minnesota found themselves facing quite unusual conditions during the early months of 1935. Because of the fact that many farmers in the 24 drought counties had no crop in 1934 and therefore no seed for 1935, the Federal Government through the Seed Stocks Office of the A. A. A. had started taking orders for Government seed.

The seed grain which the Government Seed Stocks Office planned to distribute in the drought counties had been purchased in various regions outside the drought area. This seed was purchased only after very careful inspection, and had to meet certain requirements, among which was freedom from the grade "smutty." But even though a lot of wheat or barley does not grade smutty, it may contain enough of a spore load to cause considerable loss under favorable weather conditions at seeding. Another hazard in this Government seed was the danger of introducing new forms of smut from other regions and the mixing in elevators of healthy seed with lots containing smut or other diseases.

Centrifuge tests of samples of Government seed in Minnesota elevators were made to determine the degree of smut in each lot.

1934 Seed Lots Classified According to Degree of Smut

Grain	Storage points	Trace 80 - 300 spores per kernel	Light 300 to 1,000 spores per kernel	Smutty 1,000 or more spores per kernel	Total
Wheat	Minn. elevators	27	1	3	31
Wheat	Mpls. terminal	19	1	0	20
Oats	Minn. elevators	0	1	14	15
Oats	Mpls. terminal	0	1	4	5
Barley	Minn. elevators	0	0	20	20
Barley	Mpls. terminal	0	0	9	9
Durum	Minn. elevators	1	0	0	1
All grain	Minn. storage	47	4	50	101

Continued on next page

The results of these tests indicated that smut spores were present in all lots of this seed, but more prevalent in barley and oats than in wheat. Considering the question from all angles, it was clear that this Government seed should be treated before seeding, but then many problems came up that seemed to make it impractical for the Seed Stocks Committee to assume the responsibility.

It was finally decided that the treatment of this seed should be left to the farmers receiving it, but that a special effort should be made to urge farmers to treat their seed, and to help them organize local seed-treating stations. Because of the extra work required in the drought counties, the Seed Stocks Committee lent Dr. C. C. Allison to assist the extension specialist in organizing the treating campaign in that part of the State.

Meetings on cereal disease control were held in 60 counties, between January first and April first. Except in a few cases where the programs were combined with corn-hog sessions, most of the meetings were called for discussion of grain diseases only. Arrangements for these meetings were made by the county or emergency agents, who were supplied with material for an advance story which could be used in announcing the meeting, either through local papers or by circular letters. A follow-up story was released after each meeting.

The discussions at all cereal-disease meetings were organized so as to leave a clear idea of the following main points:

1. That fungi cause the most important diseases of grain.

2. That the development of plant diseases may be influenced by weather.

3. That some varieties of grain are more resistant than others.

4. That seed treatment is effective in the control of certain smuts and other diseases.

5. That certain precautions must be observed in various methods of seed treatment, and

6. That seed grain can be treated at community seed-treating stations effectively and economically.

Elevator owners and managers are naturally interested in clean grain as well as in the possibilities for treating seed at elevators, and were therefore invited to attend these special meetings. Many elevator visits were made by Dr. Allison and the extension specialist.

Early in the year, when the Seed Stocks Committee was getting ready to send application forms for seed to the drought counties, it was decided that application forms for seed treatment would be sent at the same time. These seed-treating applications gave the farmer a chance to indicate whether he wanted his seed grain treated at the local elevator at a charge of not over 3 cents a bushel. If there appeared to be sufficient seed designated for treatment to

Continued on next page

make the installation of equipment worth while, the local seed committee could then arrange for carrying out the plan, otherwise the plan would be dropped. In some counties these forms were sent out to farmers by mail, and in other counties they were distributed at meetings.

The treating applications were finally returned to the county agents' offices and the data summarized.

Applications for the Treating of Seed Grain at Elevators

County	Bu. Government seed ordered	Bu. seed to be treated at elevator	Percentage to be treated at elevator
Becker.....	0	6,813	-
Chippewa.....	130,032	39,575	30
Douglas.....	33,692	16,979	47
Grant.....	33,445	8,346	25
Pope.....	137,621	30,236	22
Renville.....	0	1,498	-
Stearns.....	118,438	20,977	17
Swift.....	193,000	19,299	10
Traverse.....	121,068	14,584	12
Wright.....	0	7,157	-
Yellow Medicine	110,491	38,699	35

Another job that took some of the specialist's time during the early part of the year was the periodic checking up on the developments in the seed-treating machines. Two manufacturing companies in Minneapolis started making large-capacity treaters for the first time in 1935 and some difficulty was experienced in getting the chemical feed adjusted satisfactorily.

Jobbers and wholesalers of chemicals in Minnesota were advised to carry sufficient stock to meet such demand as might develop from the result of the campaign. Some of the chemical companies sent out to their retailers special literature and forms for newspaper advertising. Grain men throughout the State were much interested in the campaign and gave excellent cooperation whenever they had a chance.

The first results of the cereal disease-control campaign were noticeable even before the seeding was under way. While the meetings were still in progress, many elevators and grain dealers purchased treating machines and were offering seed-treating service to farmers at 3 cents per bushel or less.

One of the surprising things about these elevator treating stations was that most of them were located outside the drought area, where it was necessary for farmers to make a special trip to the elevator. We had expected that the elevator seed-treating idea would have a stronger appeal to the farmers who had to go to the local elevators to get their allotment of Government seed.

Continued on next page

There should have been more seed-treating stations in the drought counties, but because of delay in seed loans some farmers changed their minds about seed treatment, and elevator men hesitated to install equipment without assurance that enough of the farmers would use it. Some of the elevators and seed dealers sold seed-treating chemicals to farmers who preferred to treat their seed at home.

Three of the four jobbing houses in Minneapolis reported sales of over 8½ tons of New Improved Ceresan. While these sales covered Wisconsin and North Dakota as well as Minnesota, most of the Ceresan was sold in this State. The increase in sales ranged from 250 to 827 percent.

One retailer in Crookston sold seven Ceresan machines at $40 each to small groups ranging from three to four neighbors to a machine. This same dealer sold 4,135 pounds of New Improved Ceresan in 1935 as against 384 pounds in 1934.

An elevator manager at Nielsville stated that 95 percent of the crop in his territory was treated last spring, and others throughout the grain area reported large increases in the treating of 1935 seed.

A smut survey in 13 counties during July indicated that the treatment of wheat and barley with the New Improved Ceresan was quite effective for the control of the covered smuts. The results of the wheat survey are shown in the following table:

Minnesota Wheat Smut Survey - 1935

Treatment	No. fields treated	Percentage of bunt
New Improved Ceresan	25	0
Formaldehyde	5	3.6
Treatment unknown	8	0
No Treatment	11	4.9
Total and average	49	1.4

"Ceresan" is a trade name registered in the U. S. Patent office by the Bayer-Semesan Company, Wilmington, Delaware.

BEETLES IN TREES CONTROLLED BY POISON CARRIED IN SAP STREAM BY NEW METHODS

EDITOR'S NOTE:- One of the most interesting papers presented at the Eighth Annual Meeting of the Eastern Branch, American Association of Economic Entomologists, was that on Experimental Work with Tree Medication" by Dr. F. C. Craighead and Mr. R. A. St. George, Division of Forest Insect Investigations, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture. This experimental work is discussed in an article contributed by the Department and which appears below.

Trees doomed to die from insect attack may help save neighboring trees from the same fate. The only practical way previously devised for controlling bark beetles -- a serious threat to American forests -- is the destruction of trees into which large numbers of beetles have tunneled. These trees usually are felled and burned, or their bark is peeled off and burned -- a costly method.

Searching for new and better control measures, entomologists of the U. S. Department of Agriculture have worked out promising methods for introducing into the sap stream of an infested tree chemicals poisonous to the insects. The rising sap carries these chemicals -- zinc chloride and copper sulphate -- all through the tree, impregnating the tissues much more simply and at far less cost than could be done with an outside force.

Important Advantages

Besides killing all insect life in the tree, the injected fluid makes the wood immune to further insect attack. Treated trees, therefore, may be left standing for several years, until it is convenient to start logging operations in their vicinity. Furthermore, posts, poles, and logs in the round from the treated trees will resist insect attack and decay that soon ruin untreated timber in contact with the ground. As a method of preserving forest products, the entomologists say, these treatments can not take the place of commercial dipping and pressure processes. They are, however, practical for farmers and foresters needing rough timber for fences or for rustic furniture, cabins, or bridges on the land where the trees grew. Nor can these methods of destroying insect pests be used on trees to be kept alive. They are bound to kill the tree, as well as the beetles in it.

Zinc chloride and copper sulphate have given best results in the department's tests for the last 10 years. Zinc chloride is somewhat better than copper sulphate, as the copper salt corrodes any metallic object -- such as nails -- brought in contact with it.

Continued on next page

New Methods Developed

Early attempts to introduce the salts by boring holes in the tree trunk and connecting these holes with a reservoir containing the solution did not work very well. Sap rises in such narrow channels, with so little sidewise movement, that the injected fluid ascends in narrow bands that affect only the limbs directly over the point of injection. Now the chemicals are introduced around the entire circumference of the tree.

A tree to be treated must be green and its crown must be left intact during the treatment. The simplest method -- adapted to small trees -- is to cut the tree off at its base, lodging the top in the crown of another tree, or in some other support to keep it upright, and set it in a pail of the solution. With trees too large to handle this way, the bark is removed from around the base. Then a notch is sawed through several annual layers of wood in the center of the smooth, bark-free strip and a wide rubber band is stretched around the notch. The solution is run under the band into the notch.

Concentrations of 1 pound of the powdered chemical to 1/2 gallon of water for each cubic foot of wood in the tree stem have proved most satisfactory. The time required for the treatment varies with the physiological activity of the tree, particularly the rate of transpiration. On a bright, sunny day a gallon or two of solution will be taken up in one to three hours; in cloudy or cool weather, 24 hours may be necessary for complete absorption. Distribution of the chemical to all parts of the sapwood takes 5 or 10 days longer.

The department's experiments have been confined to a few tree species, principally pine, spruce, fir, oak, hickory, and yellow poplar. The entomologists believe, however, that all species, except those with excessively thick or irregular cell masses, such as black locust and white oak, can be treated in this way.

The usefulness of tree treatments for insect control in the Southeast is limited because of the rapid growth of fungi -- the so-called blue stains -- introduced by southern pine beetles when they attack shortleaf pines. Permeating the outer layers of sapwood within five days to a week, these fungi prevent the effective distribution of the chemical. In Idaho and Montana, however, the mountain pine beetle can be controlled successfully by treatments started 60, or even 90, days after it attacks white pines.

Green, healthy conifers may be treated at any time of the year except in freezing weather. The chemicals are absorbed most rapidly in the growing season, however. Hardwoods readily take up the chemicals during the active growing season. After the leaves have fallen treatment is possible, but it takes longer and results are not so uniform.

WILDLIFE PRESERVATION AND SOIL CONSERVATION COMBINED IN APPROVED AGRICULTURAL PRACTICES

EDITOR'S NOTE:- In informed circles it is now an accepted fact that farm practices which destroy the habitat of wildlife need to be corrected unless a great natural resource, worth millions of dollars annually, is to be sacrificed, and losses from insect pests increased. Therefore, it is encouraging to note that a start has been made along corrective lines, as is shown by the article below. It would seem that considerable additional benefit could result from making every gully a miniature wildlife sanctuary.

Five inexpensive and widely applicable measures which conserve the soil and at the same time preserve wildlife, have been tested recently near Harwood, Maryland, by the Soil Conservation Service. Ernest G. Holt, in charge of wildlife work, says the methods are generally adaptable to all agricultural sections of the country and are particularly successful in preserving such wildlife as rabbits and quail.

The five measures, in general, make use of resources readily available on the average farm, and one or more of the methods will help preserve wildlife on farms in every part of the country, Mr. Holt says.

The tested measures include:

1. The planting of mixed grains in protected areas where winter food for game and birds is lacking. These plantings, while helping to control soil erosion, can be easily accessible to wildlife, yet can be placed where they will not interfere with the cropping system.

2. Soil-binding trees, shrubs, or cover crops are used by farmers to reclaim gullied land and check gully spread. It is an easy matter to include in the erosion-control plantings some shrubs or plants which furnish food for wildlife. There are many such plants, but some of the more widely used are: lespedeza, coralberry, toyon (an evergreen shrub sometimes known as the California holly), blackberry, dogwoods, and viburnums.

3. Fencing of farm woodlands for protection from grazing also helps to conserve wildlife. Protecting woodland areas from farm livestock permits the growth of forest trees and shrubs which provide food for wildlife. The combination planting of trees and food-producing shrubs not only supplies food for small game and birds, but also may add to the quality of a forest stand and contributes materially to erosion control. Many farm woodlands are not grazed,

Continued on next page

but are still in need of stand improvement. In these cases, the Service recommends planting the kinds of trees and shrubs which improve the quality of the stand and which, at the same time, add to the effectiveness of the soil-saving program. Wildlife should not be forgotten when such plantings are made. Open spaces may be purposely left in the woods and allowed to grow to briars and shrubs, in order to supply food for small game and birds.

4. Whenever it is necessary to clean brush or hedgerows for fencing or woodland improvements, the brush piles may be left as cover for birds, rabbits, and other wildlife. Tree tops and brush neatly piled and left on the ground through the winter furnish welcome cover and shelter for birds and small game. In woodland cuttings, a few snags may be left to provide nesting places for nuthatches, chickadees, flickers, woodpeckers and other birds valuable to the farmer.

5. In farm woodlands of hardwoods, strips and borders of pine and spruce have been planted on many acres this fall. This is particularly true in locust plantations where it is considered that these strips, by shading the trunks of the trees, materially aid in reducing locust borer injury. These strips and borders serve well as wildlife cover areas.

Wherever practical erosion control workers interested in wildlife also discourage fence-row cleaning, so that vegetative growth along fence rows will be saved for wildlife shelter and food. This practice may find application in many parts of the country, since the activities of birds are likely to more than compensate for any weed or insect pests that may be harbored in fence rows.

TREE REPLANTING DURING WINTER MONTHS FACILITATED BY USE OF DYNAMITE TO BLAST HOLES FOR RESETTING

EDITOR'S NOTE:- This method of blasting in frozen ground to provide holes for the replanting of trees has been developed by agricultural engineers. Because of certain advantages the method offers, it is expected to come into more and more use as the procedure becomes known.

By L. F. Livingston, Manager,
Agricultural Extension Section,
E. I. du Pont de Nemours & Co.

The transplanting of trees during the Winter months in sections of the country where freezing of the ground occurs offers several decided advantages. One of these advantages comes from the fact that the frost holds the dirt around the small roots of a tree when it is moved and gives it a better chance to live.

In moving a tree to another location, a circular trench of a diameter to include the roots is dug with pick and shovel to a depth below the frost line. The tree is then taken out and transported by the usual means employed by nurserymen. The really difficult part of the operation would be to attempt to make the hole to receive the tree by digging. But an excavation of the proper diameter and depth can be made by using dynamite to blast out the frozen ground. For this purpose a 40 per cent extra grade of dynamite will do excellent work.

Usually, four holes to receive the dynamite, properly spaced, are put down on four-foot centers in a square. Each hole should be loaded with one stick of dynamite per foot depth of the frost. It is absolutely essential that the dynamite be loaded in the frozen stratum, and not below it. Should the explosive be loaded below the frost line, much of the force of the explosion would be wasted by the "cushioning" of the softer soil below the frost level and merely a "pocket" would result. Loaded holes must be tamped with sand or soil to confine the gases generated by the detonation of dynamite which do the useful work of a blast.

The Best Tool for Making Holes

Little difficulty will be experienced in making bore holes in frozen ground, provided that a coal or shale auger is used for the purpose. This type of auger has two cutting points which adapt the tool to boring in a hard material such as frozen soil.

A drill bit can be used with good results, but slower progress is made than with a shale auger. An earth auger is practically useless for the work. The ordinary pointed driving iron is likely to bounce out of frozen earth when hit

Continued on next page

with a sledge-hammer. The shooting should be done by the electric method, using electric blasting caps, and an electric blasting machine to fire them. As in all cases where a group of holes is to be shot, the electric blasting caps should be wired in series so that all the holes will be shot simultaneously.

Method Proved Successful in Michigan

In a section of Michigan, where some 200 trees were moved from a swamp to high ground, the method described was followed with excellent results. The frost in the swamp was only six inches deep, but the roots were of lateral formation, and the frost held the dirt securely. During the winter time, when labor is usually available, many jobs may be done with the aid of dynamite. Included in such work is excavating for a root cellar, or for a trench silo, or for a farm building. By the use of a little dynamite, the frost area can be broken up and hand tools or a scraper used to remove earth.

Precautions to be Observed

Fragments of frozen ground from a blast are as capable of injuring persons or damaging property as are pieces of rock. It, therefore, is necessary for the blaster and others to be at a safe distance when a shot is fired. Also, blasting should not be done too near to buildings, highways -- unless guarded --, electric power lines or telephone lines. In order to avoid possibility of injury to those doing the work, the leading wires from the electric blasting caps to the blasting machine must be sufficiently long to insure safety.

All other rules relating to the safe use of explosives must be observed. No one who does not fully understand the handling of dynamite should attempt to do blasting of any kind.

#######

C O N T R I B U T O R S

Having as a principal purpose the presentation of reliable and timely information on agricultural developments and related topics, the AGRICULTURAL NEWS LETTER has been fortunate in being enabled to offer its readers authoritative discussions by the following contributors:

E. B. Alvord, Manager, New Products Division, Grasselli Chemicals Department, E. I. du Pont de Nemours & Co., Cleveland, Ohio.

Dr. P. N. Annand, Senior Entomologist,
Bureau of Entomology and Plant Quarantine,
U. S. Department of Agriculture.

E. W. Bousquet, Research Chemist,
Experimental Station, E. I. du Pont de Nemours and Co.

Dr. Harry F. Dietz, Research Entomologist,
Grasselli Chemicals Department,
E. I. du Pont de Nemours & Co., Experimental
Station, Wilmington, Del.

J. Hunter Gooding, Bayer-Semesan Co., Wilmington, Del.

Dr. Frederick C. Hahn, Experimental Station,
E. I. du Pont de Nemours & Co., Wilmington, Del.

Dr. R. J. Haskell, Extension Plant Pathologist,
Extension Service, U. S. Department of Agriculture.

L. F. Livingston, Manager, Agricultural Extension
Section, Explosives Department, E. I. du Pont de
Nemours & Company, Wilmington, Del.

G. F. Miles, Director of Research,
Bayer-Semesan Co., Wilmington, Del.

Dr. F. W. Parker, Agronomist, Ammonia Department,
E. I. du Pont de Nemours & Co., Wilmington, Del.

I. L. Ressler, Entomologist, R. & H. Chemicals Department,
E. I. du Pont de Nemours & Co., Niagara Falls, N. Y.

Dr. Paul L. Salzberg, Research Chemist, Experimental
Station, E. I. du Pont de Nemours & Co., Wilmington, Del.

A. F. Swain, The Pacific Division, R. & H. Chemicals
Department, E. I. du Pont de Nemours & Co., El Monte, Cal.

Dr. W. H. Tisdale, Manager, Pest Control Research Division,
Grasselli Chemicals Department, E. I. du Pont de Nemours & Co.,
Experimental Station, Wilmington, Del.

R. J. Thompson, Refrigerator Engineer,
Kinetic Chemicals Co., Wilmington, Del.

########